

**UNITED STATES DISTRICT COURT
DISTRICT OF MASSACHUSETTS**

SINGULAR COMPUTING LLC,

Plaintiff,

v.

GOOGLE LLC,

Defendant.

Civil Action No. 1:19-cv-12551-FDS

Hon. F. Dennis Saylor IV

**REPLY IN SUPPORT OF PLAINTIFF’S
MOTION FOR PARTIAL SUMMARY JUDGMENT OF VALIDITY
BASED UPON *INTER PARTES* REVIEW ESTOPPEL
UNDER 35 U.S.C. § 315(e)(2)**

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Plaintiff, Singular Computing LLC (“Singular”), respectfully submits this reply in support of its motion for partial summary judgment of validity based upon *inter partes* review estoppel. For the reasons set forth herein and in its opening brief, Singular requests that the motion be granted.

I. GOOGLE’S NON-OPPOSITION TO THE BULK OF SINGULAR’S MOTION WARRANTS GRANTING FORTHWITH THE GREAT MAJORITY OF THE RELIEF REQUESTED

Google inappropriately and inaccurately characterizes Singular’s present motion as “fatally superficial and meritless.” *See* Opp. at 1. In its opening brief, Singular identified the following three categories of prior art as to which IPR-estoppel should be applied:

- A. ART CITED BY GOOGLE IN THE IPR PROCEEDINGS (*see* Dkt. No. 377-1 at 4-5);
- B. OTHER PRIOR ART KNOWN TO GOOGLE WHEN IT FILED FOR IPR (*id.* at 5-6);
- C. DEVICE PRIOR ART (*id.* at 6-8).

As to categories A and B, Google does not deny that it was aware of the patents and other printed publications contained in its invalidity contentions at the time that it filed its petitions for IPR. *See* Google’s Responses to Singular’s Statement of Undisputed Facts Nos. 18-20 (Dkt. No. 396 at pp. 6-7). Thus, for the reasons stated on pages 2-6 of Singular’s opening brief, Google is estopped from relying on any and all of those patents and printed publications here. *See, e.g., Cal. Inst. of Tech. v. Broadcom Ltd.*, 25 F.4th 976, 991 (Fed. Cir. 2022); *see also* October 28, 2022 Order (Dkt. No. 375) at pp. 4-6. Consequently, and because Google’s opposition brief does not address these two categories of prior art, Singular requests that the Court now grant partial summary judgment with respect to all prior art patents and printed publications addressed in Singular’s opening brief. *See, e.g., Eck v. Neal*, No. 1:14-cv-13693, 2017 WL 4364171, at **6-7

n. 5 (D. Mass. Sept. 29, 2017) (granting summary judgment as to grounds not addressed in opposition); *see also Clinton v. Maxim Lift, Inc.*, No. 12-11072, 2015 WL 12683973, at **2-3 (D. Mass. Mar. 23, 2015) (same).

As Singular’s rebuttal invalidity expert report is due to be served by February 10, 2023, this will also have the salutary effect, consistent with Fed. R. Civ. P. 1, of relieving Singular’s expert from responding to the majority of Google’s invalidity arguments. Granting partial summary judgment now will also be consistent with the Congressional intent of enacting IPR to “reduce federal litigation” and avoid the wasteful use of such time and resources. *See Medtronic, Inc. v. Lee*, 151 F. Supp. 3d 665, 676 (E.D. Va. 2016); *see also* H.R. Rep. No. 96-1307, pt. 1, at 2 (1980), *as reprinted in* 1980 U.S.C.C.A.N 6460, 6463 (IPR “will permit efficient resolution of questions about the validity of issued patents without recourse to expensive and lengthy infringement litigation”); *Synkloud Techs., LLC v. Cartessa Aesthetics, LLC*, No. 21-cv-4423, 2022 WL 104621, at *3 (E.D.N.Y. Apr. 6, 2022) (recognizing “the AIA’s purpose to streamline litigation” via IPR).

II. AS GOOGLE’S THREE PRIOR ART SYSTEMS ARE PRINTED PRIOR ART PUBLICATIONS CLOAKED AS DEVICE PRIOR ART, ESTOPPEL APPLIES

Google’s attempt to rely upon the device prior art described in the printed publications cited in its claim charts is improper because it is “simply swapping labels for what is otherwise a patent or printed publication invalidity ground in order to ‘cloak’ its prior art ground and ‘skirt’ estoppel.” *Cal. Inst. of Tech. v. Broadcom Ltd.*, 2019 WL 11828236, at *7 (C.D. Cal. Mar. 11, 2019).¹ In a similar case, such a post-IPR attempt to rely on device prior art was found to be “disingenuous”:

¹ In footnote 10, on page 8 of its brief, Google quotes note 3 from the Court’s October 28, 2022 Order. The Court did not decide whether or not estoppel applied to the referenced devices as that

While [defendant] seeks to cloak its reliance upon UVHC3000 as a product, so as to avoid § 315(e)(2) estoppel, such an argument is disingenuous as it is the UVHC3000 datasheet upon which [defendant] relies to invalidate the asserted claims.

Clearlamp, LLC v. LKQ Corp., No. 12 C 2533, 2016 WL 4734389, at *8 (N.D. Ill. Mar. 18, 2016).

Likewise here, although it could not submit the actual devices, Google could have presented its printed prior art publications describing the devices to the PTAB because Google was aware of those publications when it requested IPR of the '156 and '273 patents.

Where there is evidence that a petitioner had reasonable access to printed publications corresponding to or describing a product that it could have proffered during the IPR process, it cannot avoid estoppel simply by pointing to its finished product (rather than the printed materials) during litigation. . . .

Oil-Dri v. Nestlé Purina, 2019 WL 861394, at *10 (N.D. Ill. Feb. 22, 2019).

A. THE VFLOAT SYSTEM

Google states as follows regarding the VFLOAT system:

As Dr. Leeser will testify at trial, in connection with a subcontract that Los Alamos National Laboratory awarded to Northeastern University, she and her graduate students developed a library of parametrized hardware modules written in VHDL code, for performing variable-precision arithmetic on floating-point numbers with custom formats, which they later named “VFLOAT.”

Google Opp. at 7 (footnotes omitted). Thus, this system, allegedly developed by Dr. Leeser and her students, constitutes a “a library of parametrized hardware modules written in VHDL code, for performing variable-precision arithmetic on floating-point numbers with custom formats.”

issue was not before the Court and the present motion had not even been filed. The estoppel at issue there was with respect to the Hamada and Lienhart references. *See* Dkt. No. 381 10/25/22 Hearing Tr. at 26:17-21.

This library device was described in printed publications that Google cited in its Invalidity Contention claim charts.² According to Google, its claim charts “identify how the prior art discloses each limitation of each asserted claim.” *See* Ex. H, p. 8.³ Thus, while alleging here that the Belanović/Leeser device anticipates the asserted claims (*see* Ex. H, p. 7), Google nonetheless did not use these printed publications describing the device as a basis for invalidity in the IPR proceedings. In one of the claim charts (labeled by Google as “Belanović⁴ and Leeser”), Google asserted as follows:

As reflected in Pavle Belanovic’s thesis, *Library of Parameterized Hardware Modules for Floating-Point Arithmetic with an Example Application*, and his related article with Miriam Leeser, *Library of Parameterized Floating-Point Modules and Their Use*, they made and used a system that consists of a device. *See, e.g.:*

“The Wildstar Reconfigurable Computing Engine

Reconfigurable computing is characterized by use of hardware elements that have reconfigurable architectures, as opposed to general purpose computing which uses hardware elements with fixed architectures.

Many reconfigurable computing systems are based on one or more FPGAs connected to a number of memory banks. All designs presented in this project are implemented on the Wildstar reconfigurable computing engine from Annapolis Micro Systems. Figure 1.2 shows the structure of this board.

Some of the main features of the Wildstar board are:

- 3 Xilinx VIRTEX XCV1000 FPGAs,
- total of 3 million system gates,
- 40 Mbytes of SRAM,
- 1.6 Gbytes/sec I/O bandwidth,
- 6.4 Gbytes/sec memory bandwidth,
- processing clock rates up to 100MHz.”

Belanovic, *Library of Parameterized Hardware Modules for Floating-Point Arithmetic with an Example Application* at 14.

See Ex. R, p. 1 (highlighting added).

² As set forth above, Google has not denied that it was aware of this prior art at the time it filed for IPR. Nor could it, because Google served its Invalidity Contentions citing those printed publications when it filed for IPR. *See* Singular Op. Br. at 5.

³ Exhibits A-Y were submitted with the Declaration of Kevin Gannon in support of Singular’s opening brief. *See* Dkt. No. 377. Exhibit Z is attached to the Second Declaration of Kevin Gannon filed herewith.

⁴ Pavle Belanović was one of Dr. Leeser’s graduate students.

The 21-page claim chart alleges that each element of the claims is found in the floating-point arithmetic library described in the Belanović thesis and the Leeser article. *Id.* at 1-21. This printed publication also includes structural schematics, floating-point formats and source code:

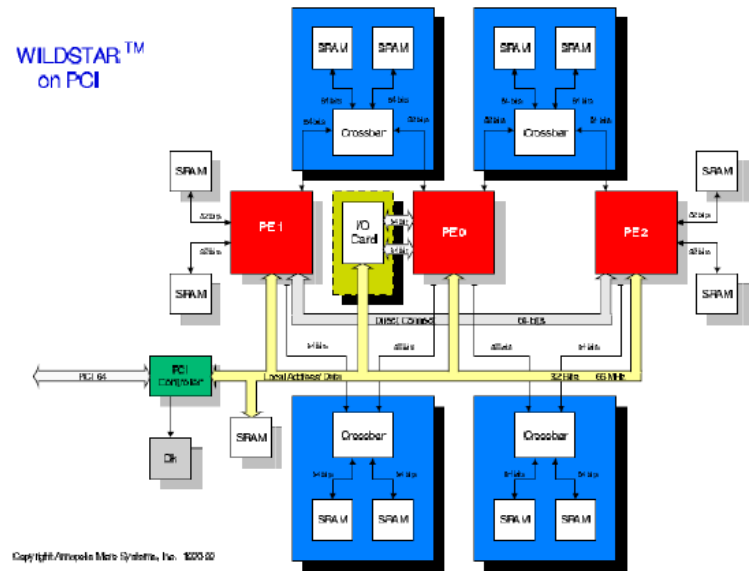


Figure 1.2: Structure of the Wildstar reconfigurable computing engine

Id. at 3.

Floating-point formats used in the experiments were chosen to represent the range of realistic floating-point formats from 8 to 32 bits in total bitwidth and include the IEEE single precision format (E1 in Table 2.2).” Belanovic, *Library of Parameterized Hardware* at 46-47.

Format	Table 2.2: Operator synthesis results			Area		Per IC	
	total	exponent	fraction	fp_add	fp_mul	fp_add	fp_mul
A0	8	2	5	39	46	236	200
A1	8	3	4	39	51	236	180
A2	8	4	3	32	36	288	256
B0	12	3	8	84	127	109	72
B1	12	4	7	80	140	115	65
B2	12	5	6	81	108	113	85
C0	16	4	11	121	208	76	44
C1	16	5	10	141	178	65	51
C2	16	6	9	113	150	81	61
D0	24	6	17	221	421	41	21
D1	24	8	15	216	431	42	21
D2	24	10	13	217	275	42	33
E0	32	5	26	328	766	28	12
E1	32	8	23	291	674	31	13
E2	32	11	20	284	536	32	17

Id. at 6. The source code is set forth in Appendices A and B to the Belanović printed publication. *See* Second Declaration of Kevin Gannon, Ex. Z. Accordingly, Google’s attempt to rely on the VFLOAT “device” here should be estopped, as Google could have submitted these purportedly anticipatory publications that Google alleges disclose each and every claim element

to the PTAB during IPR. *See, e.g., Wasica Fin. GmbH v. Schrader Int'l Inc.*, 432 F. Supp. 3d 448, 453-54 (D. Del. 2020) (estopping reliance on ZR-1 Sensor device because defendant possessed a “printed publication that discloses all of the relevant features of the ZR-1 Sensors [that] could have been raised during the IPR”); *Avanos v. Medtronic*, 2021 WL 8693677, at *2.

B. THE CNAPS SYSTEM

Google’s second “system” is the CNAPS device. As with the Belanović/Leeser library system, Google served Singular with an invalidity claim chart addressing this device at the time it filed for IPR. *See* Ex. K. As with the Belanović/Leeser library charts, Google alleges that the printed publications cited in the CNAPS claim chart describes each and every element of the challenged claims. *Id.* Again, Google asserts that its claim charts “identify how the prior art discloses each limitation of each asserted claim.” *See* Ex. H, p. 8. For example, Google’s CNAPS invalidity claim chart includes multiple schematics of the system:

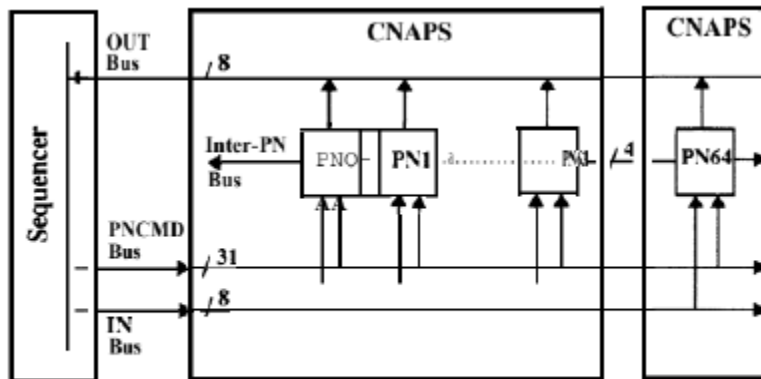


FIGURE 1 The basic CNAPS architecture. CNAPS is a single instruction, multiple data (SIMD) architecture that uses broadcast input, one-dimensional interprocessor communication, and a single shared output bus.

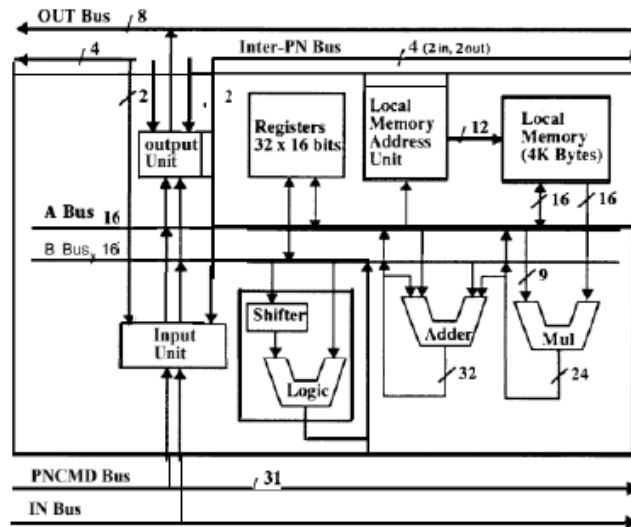


FIGURE 2 The internal structure of a CNAPS processor node (PN). Each PN has its own storage and arithmetic capabilities. Storage consists of 4096 bytes. Arithmetic operations include multiply, accumulate, logic, and shift. All units are interconnected by two 16-bit buses.

Dan Hammerstrom, *AN INTRODUCTION TO NEURAL AND ELECTRONIC NETWORKS* 338 (2d ed. 1995).

Ex. K, pp. 2, 5. In its 24-page CNAPS claim chart, Google asserts that the CNAPS system as described in the cited publications invalidates the challenged claims because it could perform all of the processing recited in the claims. *Id.* As with the allegedly anticipatory Belanović/Leeser printed publications, Google did not use the allegedly invalidating CNAPS claim chart publications as a basis for arguing invalidity in the IPR proceedings. Accordingly, Google's attempt to rely on the CNAPS device here should be estopped, as Google could have submitted these allegedly anticipatory publications disclosing each and every claim element to the PTAB during IPR. *See, e.g., Wasica*, 432 F. Supp. 3d at 453-54; *Avanos*, 2021 WL 8693677, at *2.

C. THE GRAPE-3 SYSTEM

Google’s third “system” is the GRAPE-3 device. Google alleges that the GRAPE-3 device anticipates the challenged claims. *See* Ex. H, p. 7. As with the Belanović/Leeser library and the CNAPS device, Google served Singular with an invalidity claim chart based on this device at the time that it filed for IPR. *See* Ex. W. As with the other two device claim charts, Google alleges on an element-by-element basis that each limitation of the claims is described in

the printed publications cited therein. *Id.* As before, Google asserts that its claim charts “identify how the prior art discloses each limitation of each asserted claim.” *See* Ex. H, p. 8. For example, Google’s GRAPE-3 chart includes schematics of the system and the chip:

“GRAPE-3 consists of two identical boards. Each board has 24 GRAPE chips and calculates gravitational forces on 24 particles simultaneously [*sic*]. The structure of one GRAPE-3 board is shown in figure 3.” Okumura, et al, *GRAPE-3 Highly Parallelized Special-purpose Computer for Gravitational Many-body Simulations* at 152-53.

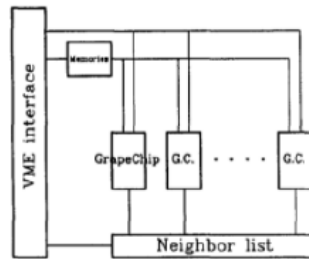
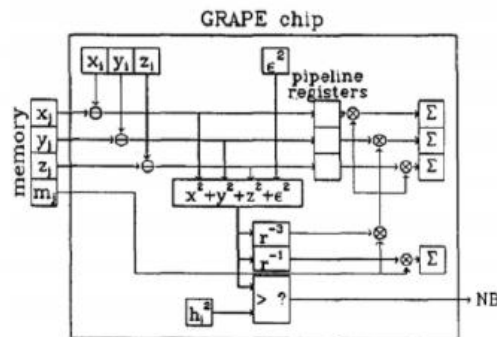


Figure 3: Block diagram of the GRAPE-3 system. 24 GRAPE chips on a board calculate gravitational forces and potential in parallel.

Each GRAPE chip contains 17 LPHDR processing elements. Okumura, et al, *GRAPE-3 Highly Parallelized Special-purpose Computer for Gravitational Many-body Simulations* at 152.



Ex. W, pp. 8-9. In its 12-page claim chart, Google asserts that the GRAPE-3 system invalidates the challenged claims because it discloses all of the processing structure recited in the claims. *Id.* Notwithstanding such allegations, Google did not use the GRAPE-3 device printed publications as a basis for arguing invalidity in the IPR proceedings. Accordingly, Google should be estopped from using the GRAPE-3 device as prior art in this case. *See, e.g., Wasica*, 432 F. Supp. 3d at 453-54; *Avanos*, 2021 WL 8693677, at *2.

D. THE SIONYX CASE

On pages 13-15 of its opposition, Google argues that this Court’s opinion in the *SiOnyx* case supports its argument that estoppel does not reach its three prior art systems. Google is mistaken. In *SiOnyx*, summary judgment was denied because there existed “a genuine issue of material fact as to whether the manufacturing specification was public.” 330 F. Supp. 3d at 603. Moreover, this Court observed that “courts have held that a party may not escape estoppel by dressing up a ground based on publicly available datasheets as a ground based on a product.” *Id.* at 603 (citing *Milwaukee Elec. Tool Corp. v. Snap-On Inc.*, 271 F. Supp. 3d 990, 1032 (E.D. Wis. 2017)); *Clearlamp*, 2016 WL 4734389, at *9; *Star Envirotech Inc. v. Redline Detection LLC*, 2015 WL 4744394, at *4 (C.D. Cal. Jan. 29, 2015)). As explained above, that is exactly what Google is attempting to do here. Google should not be allowed to opt not to use allegedly invalidating prior art in IPR and then, having failed to invalidate asserted claims in IPR, request a “second bite at the [invalidity] apple” here using the device described in those references. *See, e.g., Parallel Networks*, 2017 WL 1045912, at 12. Otherwise, Google would improperly “reap the benefits of the IPR without the downside of meaningful estoppel.” *Id.*, 2017 WL 1045912, at *12.

E. ARGUMENT REGARDING CASES RELIED UPON BY SINGULAR

On pages 15-17, Google incorrectly argues that the cases relied upon by Singular are distinguishable. First, Google implausibly argues that the *Wasica* case is distinguishable because “Google seeks to rely [on] non-cumulative evidence that could not have been presented in the IPR proceeding.” Opp. at 16. This argument is contradicted by Google’s own actions. As set forth above, the claim charts for VFLOAT, CNAPS and GRAPE-3 devices assert on an element-by-element basis that each element of the challenged claims is found in the printed publications cited therein. Accordingly, Google should be estopped from relying upon the devices that are

per se cumulative of the cited printed publications that Google could have used as a basis for IPR. *See, e.g., Wasica*, 432 F. Supp. 3d at 453-54 (estopping reliance on ZR-1 Sensor device because defendant possessed a “printed publication that discloses all of the relevant features of the ZR-1 Sensors [that] could have been raised during the IPR”); *see also Avanos v. Medtronic*, 2021 WL 8693677, at *1 (“if there is a prior art publication that ‘discloses the same elements’ as the product in question, estoppel still applies because the grounds for asserting invalidity could still have been raised in the IPR”).

Second, Google argues that *Biscotti* is distinguishable because, unlike there, Google “is not disguising a printed-publication ground as a prior-art system ground.” Opp. at 16. As explained above, however, Google’s claim charts assert invalidity on the basis that each element of the asserted claims is allegedly found in the printed publications describing the three devices upon which Google now seeks to rely. Thus, *Biscotti* is directly on point.

Third, much like its *Biscotti* argument, Google asserts that *Avanos* is distinguishable because its “non-printed-publication materials” that its seeks to rely upon “address aspects of the asserted claims that the printed-publication materials do not.” Opp. at 17. As demonstrated above, Google’s “non-printed-publication materials” are indisputedly cumulative to the printed publications cited in its element-by-element-based claim charts. Thus, *Avanos* is also on point.

Fourth, Google attempts to distinguish the *Cal. Tech.* case by arguing that “Google’s three prior-art system grounds are different from any printed-publication grounds.” Opp. at 17. Once again, Google’s three prior art systems in this case are cumulative to the printed publications describing them cited in Google’s element-by-element claim charts for those devices. Thus, Google’s argument should be rejected. *See, e.g., SiOnyx*, 330 F. Supp. 3d at 603

(several courts have held that “a party may not escape estoppel by dressing up a ground based on publicly available [publications] as a ground based on product.”)

F. ESTOPPEL WOULD PLAINLY APPLY “IF GOOGLE WAS RELYING ONLY ON PRINTED PUBLICATIONS”

Finally, Google argues that IPR estoppel would not apply to the three devices even if it were to rely only upon printed publications describing those devices. Opp. at 17-20.⁵ Google’s argument should be rejected. Otherwise, the IPR estoppel provision of 35 U.S.C. § 315(e)(2) would be rendered toothless. Google cites several cases in support of its argument. None involved the facts that exist here. In none of those cases did the defendant: (1) prepare element-by-element contention claim charts describing an allegedly anticipatory prior art device based solely upon printed publications of which the defendant was aware at the time it filed for IPR, and (2) strategically elect not to assert those publications as a basis for IPR in order to rely upon those IPR-eligible printed publications in subsequent litigation if (as here) it failed to invalidate all asserted claims in IPR. Allowing Google to proceed with prior publications that it possessed and charted alleging invalidity on an element-by-element basis at the time it filed for IPR is exactly the problem that the estoppel statute was enacted to solve.

There is no dispute that Google had knowledge and possession of the printed publications describing each device at the time it filed for IPR because the claim charts citing the printed publications were served on Singular at the time Google filed for IPR. Further, Google does not argue that it could not have requested IPR based upon the printed publications describing the

⁵ On page 19, Google states that Singular has not cited a case wherein the PTAB instituted IPR on a ground that was based on Section 102(a), public use, or prior invention under Section 102(b). That argument is a red herring. The issue here is IPR estoppel under Section 315, not IPR institution. As this Court stated in the October 28 Order, “a party cannot ‘simply swap[] labels for what is otherwise a patent or printed publication invalidity ground in order to ‘cloak’ its prior art ground and ‘skirt’ estoppel.” Dkt. No. 375, p. 6.

three devices. Instead, Google deliberately chose not to have the PTAB evaluate its arguments regarding these devices based on the printed publications that it now wants to rely upon. Thus, Google's argument should be rejected:

[Defendant] cannot put forth invalidity arguments in litigation that rely solely upon patents or printed publications that could have been raised in the IPR, and then claim that IPR estoppel does not apply because these printed materials reflect or represent a prior art product. The IPR petitioner in that situation is improperly attempting to disguise a ground that could have been raised during the IPR as one that could not have been raised.

Medline Indus., Inc. v. C.R. Bard, Inc., 2020 WL 5512132, at *5 (N.D. Ill. Sept. 14, 2020).

As this Court stated in the October 28, 2022 Order:

[P]ublications are prior art whether they stand alone, are offered in combination with each other, or are offered in combination with a system. A party cannot “simply swap[] labels for what is otherwise a patent or printed publication invalidity ground in order to “cloak” its prior art ground and “skirt” estoppel.

Dkt. No. 375, p. 6. Accordingly, Google's argument that estoppel should not apply even if it relies on the printed publications that reasonably could have been used in IPR should be rejected in accordance with 35 U.S.C. § 315(e)(2).⁶

III. CONCLUSION

For the reasons set forth above and in its opening brief, Singular requests the Court to grant this motion for partial summary judgment.

⁶ In its final paragraph, Google speculates that the Federal Circuit would agree with its argument. *See Opp.* at 20. Singular disagrees. The Federal Circuit recently overruled itself to “clarify that estoppel applies not just to claims and grounds asserted in the petition and instituted for consideration by the Board, but to all grounds not stated in the petition but which reasonably could have been asserted against the claims included in the petition.” *See Cal. Inst. of Tech. v. Broadcom Ltd.*, 25 F.4th 976, 991 (Fed. Cir. 2022). Thus, contrary to Google's argument, the Federal Circuit takes an expansive view of the IPR estoppel statute.

Dated: December 16, 2022

Respectfully submitted,

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CERTIFICATE OF SERVICE

I certify that on December 16, 2022, all counsel of record who have consented to electronic service are being served with a copy of this document via the Court's CM/ECF system.

/s/ Paul J. Hayes